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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: John G. CARMAN

Confirmation No.: 2724

Patent No.: 6,750,376 B1

Application No.: 09/576,623

Patent Date: June 15, 2004

Filing Date: May 23, 2000

For: METHODS FOR PRODUCING APOMICTIC PLANTS

Attorney Docket No.: 81938-4100

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 C.F.R. § 1.322

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Patentee hereby respectfully requests the issuance of a Certificate of Correction in connection with the above-identified patent. The corrections are listed on the attached Form PTO-1050, submitted in duplicate. The corrections requested are as follows:

Title Page:

At item (56) **References Cited**, OTHER PUBLICATIONS, please make the following corrections:

Dung et al. reference, after "its association with a gene" delete "expresses" and insert -- expressed --. See the PTO-892 attached to Paper No. 11.

Eshed et al. reference, change "Less-than-epistatic" to -- Less-than-additive-epistatic --. This change is requested to correct a clerical error made on the PTO-892 attached to Paper No. 11.

Holm et al. reference, after "crossing experiments" delete "withdiploid" and insert -- with diploid --. This change is requested merely to correct an inadvertent typographical error.

Kenny et al. reference, delete "et al.". This change is request to correct a clerical error made on the PTO-892 attached to Paper No. 11.

Purnhauser et al. reference, after "A method" delete "fro" and insert -- for --. This change is requested to correct an inadvertent typographical error.

Asker and Jerling reference, first listing, after "Apomixis in Plants, p. 81-107, 241-283, delete "1982" and insert --1992 --. See the PTO-1449 attached to Paper No. 20.

Hussey et al. reference, after "sexual embryo sacs in facultative", delete "apomietic" and insert -- apomictic --. See the PTO-1449 attached to Paper No. 20.

Carman, John G., reference, after "*Asynchronous Expression of Duplicate Genes in*", delete "*Agniosperms*" and insert -- *Angiosperms* --. See the PTO-1449 attached to Paper No. 20.

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Knox, R.B. et al. reference, after "*Apomixis in a Grass of the Andropogoneae,*", delete "Botanisk" and insert -- Botaniska --. See the PTO-1449 attached to Paper No. 11.

At column 27, line 43 (claim 13, line 7), delete "(b)".

At column 27, line 48 (claim 13, line 12), delete the second occurrence of "the". These changes are being made to correct clerical errors made in the Examiner's Amendment attached to the Notice of Allowance mailed October 24, 2003.

Please substitute the attached four (4) sheets of formal drawings, including Figs. 1A-1M, 2A-2B, 3 and 4. The drawings printed on the patent are the informal drawings filed with the original application papers on May 23, 2000. On September 13, 2002, Patentee submitted four (4) sheets of formal drawings, including Figs. 1A-1M, 2A-2B, 3 and 4, to be substituted for the drawings originally filed in this application. Also enclosed is a copy of the date-stamped return postcard receipt from the Patent Office in support thereof. The formal drawings filed on September 13, 2002 were accepted by the Examiner in the Office Action dated November 29, 2002, Paper No. 15. It is submitted that the formal drawings that were

timely and properly submitted during the prosecution of the application should be presented with the issued patent.

Furthermore, it is respectfully submitted that a certificate of correction is not appropriate to make this correction. Instead, Patentee respectfully requests that the Patent Office issue a corrected patent in lieu of the certificate of correction as a more appropriate form for presenting the formal drawings in the patent. In addition, it is requested that the reprinted patent should be made at no cost to Patentee.

A fee of $100 is believed to be due for this request. Please charge the required fees to Winston & Strawn LLP Deposit Account No. 50-1814. Please issue a Certificate of Correction in due course.

Respectfully submitted,

July 30, 2004
Date

Rodney J. Fuller (Reg. No. 46,714)
For: Allan A. Fanucci (Reg. No. 30,256)

WINSTON & STRAWN
Customer No. 28765

202-371-5838

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PATENT NO.: 6,750,376 B1
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INVENTORS: Carman

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Column 27:
Line 43, delete "(b)".
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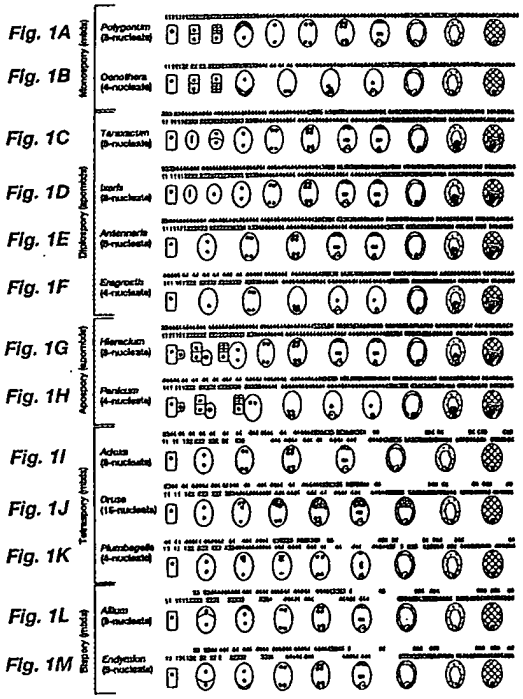
Replace Figs. 1-4 with the following figures:

1/4



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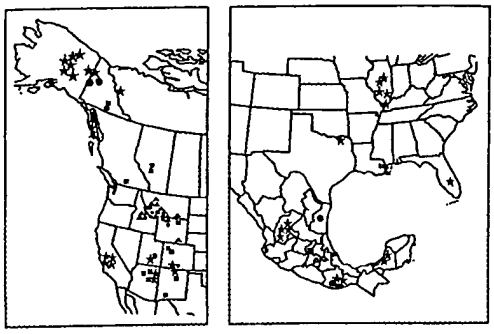

Fig. 2A Fig. 2B

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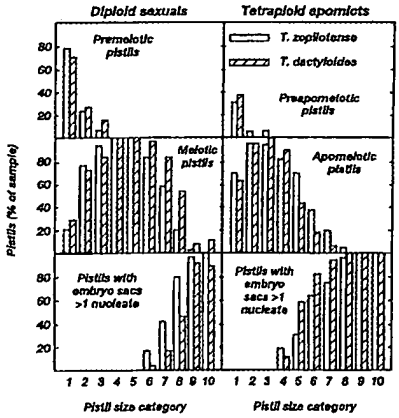

Fig. 3

UNITED STATES PATENT AND TRADEMARK OFFICE

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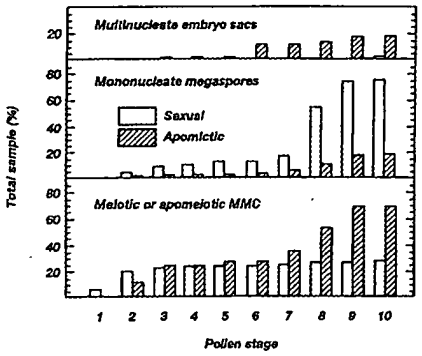

Fig. 4

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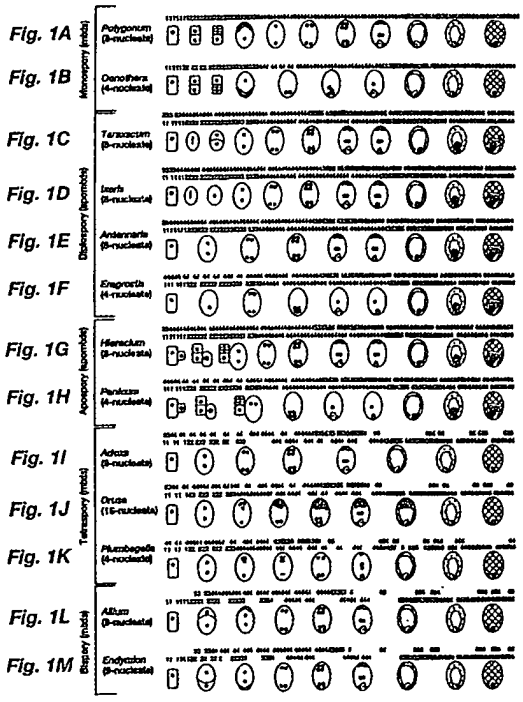

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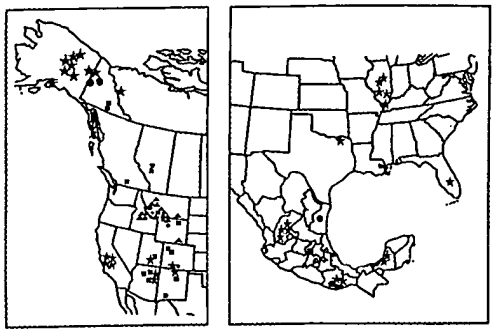

Fig. 2A Fig. 2B

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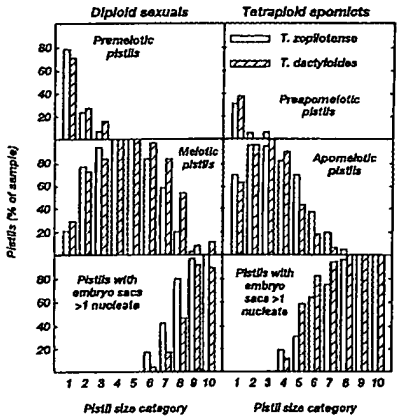

Fig. 3

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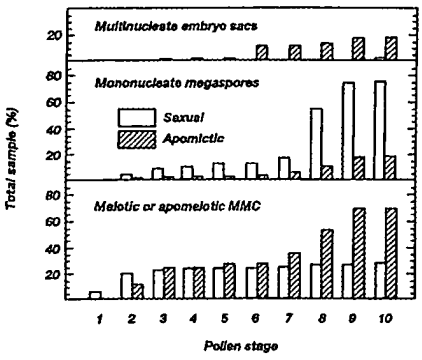

Fig. 4

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(12) **United States Patent**
Carman

(10) **Patent No.: US 6,750,376 B1**
(45) **Date of Patent: Jun. 15, 2004**

(54) **METHODS FOR PRODUCING APOMICTIC PLANTS**

(75) Inventor: **John G. Carman**, Smithfield, UT (US)

(73) Assignee: **Utah State University**, North Logan, UT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/576,623**

(22) Filed: **May 23, 2000**

Related U.S. Application Data

(63) Continuation of application No. 09/018,875, filed on Feb. 5, 1998, now abandoned.
(60) Provisional application No. 60/037,211, filed on Feb. 5, 1997.

(51) **Int. Cl.**[7] **A01H 1/02**
(52) **U.S. Cl.** **800/260**; 800/269
(58) **Field of Search** 800/260, 269, 800/266, 271, 273, 295, 298; 435/410

(56) **References Cited**

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(List continued on next page.)

Primary Examiner—Amy J. Nelson
Assistant Examiner—Anne Kubelik
(74) *Attorney, Agent, or Firm*—Winston & Strawn LLP

(57) **ABSTRACT**

Methods are provided for producing apomictic plants from sexual plants divergent with respect to responses to different photoperiods and schedules of megaspore and gametophyte development. A preferred system is to identify divergent plants from within a species or closely related group of species, accentuate the divergence by breeding, and produce artificial amphiploids that contain genomes from the apposing divergent plants. Apomixis results from the asynchronous expression of female developmental programs induced by crossing the reproductively divergent plants. The procedures for manipulating the expression of apomixis described herein permit the development of true-breeding hybrids of various cultivated crops.

17 Claims, 4 Drawing Sheets

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5. The method of claim 1 wherein said hybrid lines display a reproductive anomaly selected from the group consisting of apospory, diplospory, and polyembryony.

6. The method of claim 1 wherein the differences in flowering responses are measured in days to flowering.

7. The method of claim 1 wherein the two sets of diploid delineated sexual lines are long-day plants.

8. The method of claim 1 wherein the two sets of diploid delineated sexual lines are dual-day-length plants.

9. The method of claim 1 wherein the two sets of diploid delineated sexual lines are intermediate-day-length plants.

10. The method of claim 1 wherein the two sets of diploid delineated sexual lines are ambiphotoperiodic plants.

11. The method of claim 1 wherein the two sets of diploid delineated sexual lines are day-neutral plants.

12. A method for obtaining apomictic plants from sexual plants, wherein the method comprises:

(a) screening plants within an angiospermous plant species, genus, or family for differences in flowering responses to various photoperiods and for differences among the plants in their times of initiation of embryo sac formation and times of meiosis relative to the developmental maturity of the nongametophytic ovule and ovary tissues;

(b) selecting two plants that differ in their flowering responses to various photoperiods and that differ such that initiation of embryo sac formation in one plant occurs at about the same time as or before meiosis in the other plant relative to the developmental maturity of the nongametophytic ovule and ovary tissues;

(c) producing diploid hybrid plants that express apomixis by hybridizing said two plants,

(d) recovering hybrid seed therefrom,

(e) sowing said hybrid seed, and

(f) selecting diploid hybrid plants that are apomictic.

13. A method for obtaining polyembryonic plants from sexual aposporic, diplosporic, monocotyledonous or dicotyledonous plants, wherein the method comprises:

(a) screening plants within an angiospermous plant species, genus, or family for differences in days to flowering or photoperiod required to induce flowering, and for differences in their start times and durations of female or seed developmental stages, wherein the stages are selected from the group consisting of archespore formation, megasporogenesis, megagametogenesis, and early embryony, and wherein the differences are relative to the developmental maturity of the nongametophytic ovule and ovary tissues, wherein the tissues are selected from the group consisting of nucellus, integument, pericarp, hypanthium, and pistil wall;

(b) selecting two plants that differ

(i) in their days to flowering or photoperiod required to induce flowering, and

(ii) such that initiation of embryo sac formation in one plant occurs at about the same time as or before meiosis in the other plant relative to the developmental maturity of the nongametophytic ovule and ovary tissues; and

(c) producing progeny plants that are apomictic by sexually crossing the two plants.

14. A method for producing apomictic plants from sexual plants, wherein the method comprises:

(a) obtaining two sexual diploid plants of the same angiospermous species, genus, or family, wherein the female reproductive phenotypes of the plants differ such that under similar environmental conditions initiation of embryo sac formation in one sexual diploid plant occurs at about the same time as or before meiosis in the other sexual diploid plant relative to the developmental maturity of the nongametophytic ovule and ovary tissues; and

(b) hybridizing the two sexual diploid plants,

(c) obtaining diploid progeny therefrom, and

(d) selecting apomictic plants from among said diploid progeny.

15. A method for obtaining apomictic plants from sexual plants, wherein the method comprises:

(a) obtaining two diploid delineated sexual plants from an angiospermous plant species, genus, or family selected from families that exhibit apomixis in nature, wherein said plants differ in days to flowering or photoperiod required to induce flowering and differ such that initiation of embryo sac formation in one plant occurs at about the same time as or before meiosis in the other plant relative to the developmental maturity of the nongametophytic ovule and ovary tissue; and

(b) hybridizing said plants,

(c) recovering seed therefrom,

(d) sowing said seed, and

(e) selecting diploid hybrid plants that are apomictic.

16. A method for obtaining apomictic plants from sexual plants comprising:

(a) obtaining two diploid delineated sexual plants from an angiospermous plant species or genus selected from the grass family, wherein said plants differ in days to flowering or photoperiod required to induce flowering and differ such that initiation of embryo sac formation in one plant occurs at about the same time as or before meiosis in the other plant relative to the developmental maturity of the nongametophytic ovule and ovary tissue; and

(b) hybridizing said plants,

(c) recovering seed therefrom,

(d) sowing said seed, and

(e) selecting diploid hybrid plants that are apomictic.

17. A method for obtaining apomictic plants from sexual plants comprising:

(a) obtaining two diploid sexual plants from an angiospermous plant species or genus selected from the Asteraceae family, wherein said plants differ in days to flowering or photoperiod required to induce flowering and differ such that initiation of embryo sac formation in one plant occurs at about the same time as or before meiosis in the other plant relative to the developmental maturity of the nongametophytic ovule and ovary tissue; and

(b) hybridizing said plants,

(c) recovering seed therefrom,

(d) sowing said seed, and

(e) selecting diploid hybrid plants that are apomictic.

* * * * *

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Client:	Utah State University
Applicant:	John G. Carman
Serial No.:	09/576,623
Filed:	May 23, 2000
Title:	METHODS FOR PRODUCING APOMICTIC PLANTS
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- Response under 37 C.F.R. §1.111
- Replacement sheets of formal drawings
- Petition under 37 C.F.R. 1.136(a)
- Check No. 5475 for $55.00
- Certificate of Mailing

Alan J. Howarth
CLAYTON, HOWARTH & CANNON, P.C.
P.O. Box 1909
Sandy, Utah 84091

Fig. 1A

Fig. 1B

Fig. 1C

Fig. 1D

Fig. 1E

Fig. 1F

Fig. 1G

Fig. 1H

Fig. 1I

Fig. 1J

Fig. 1K

Fig. 1L

Fig. 1M

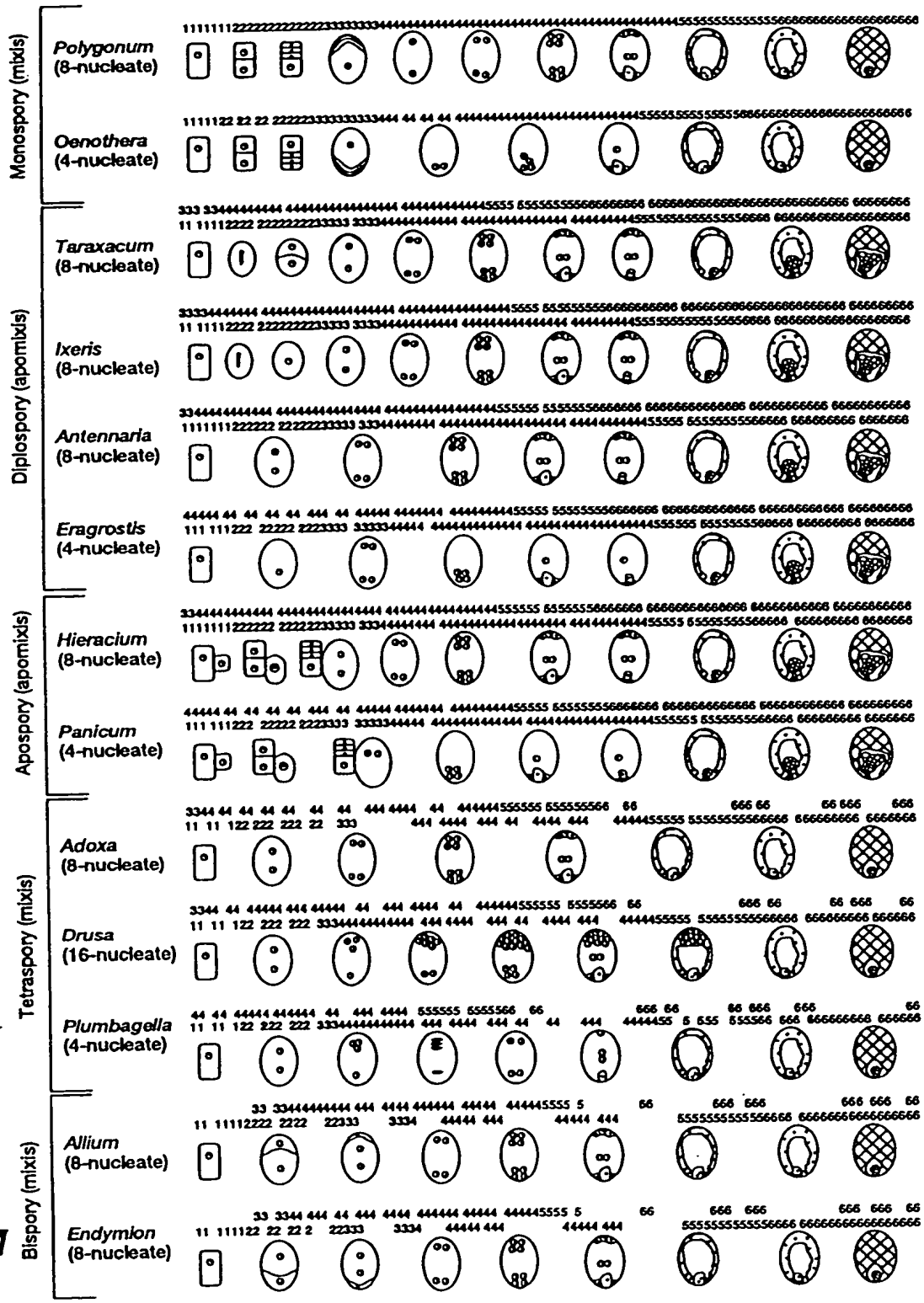

Fig. 2A

Fig. 2B

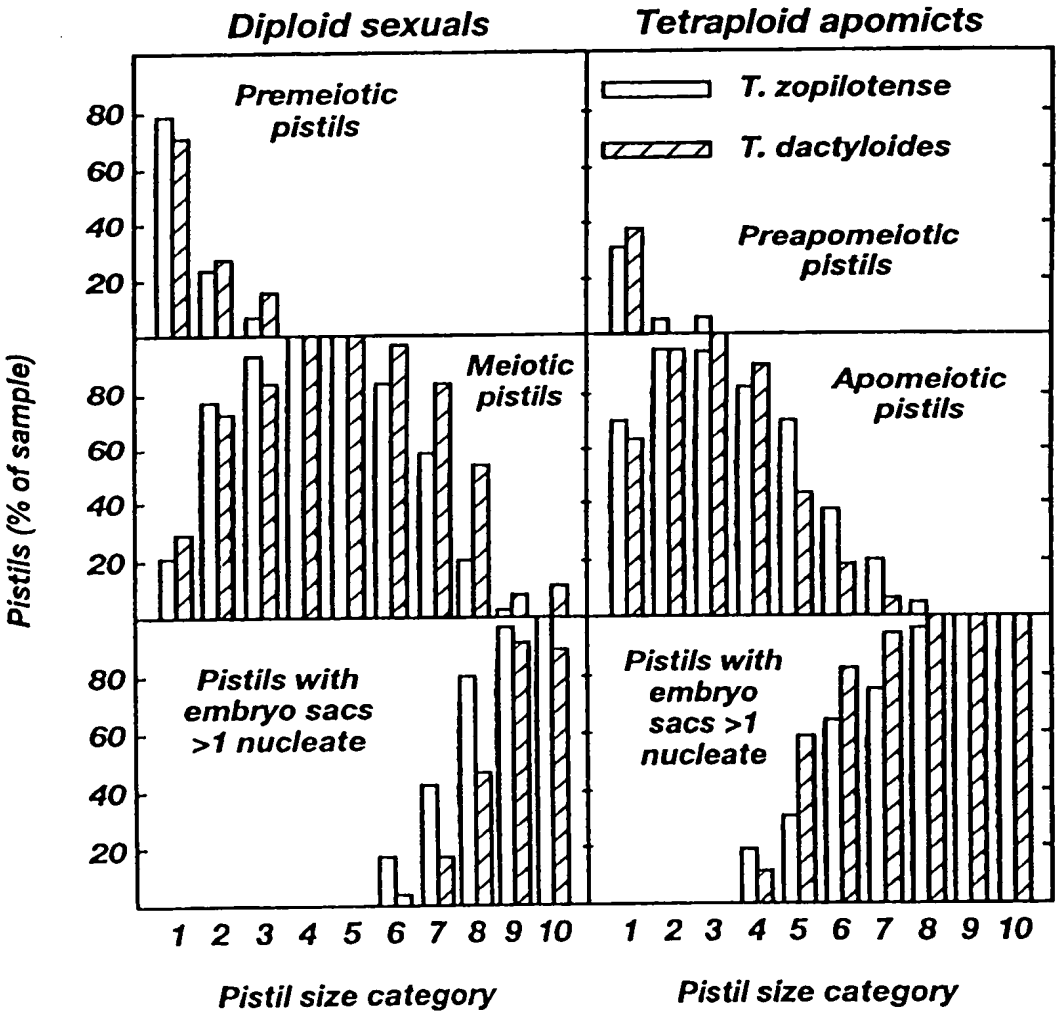

Fig. 3

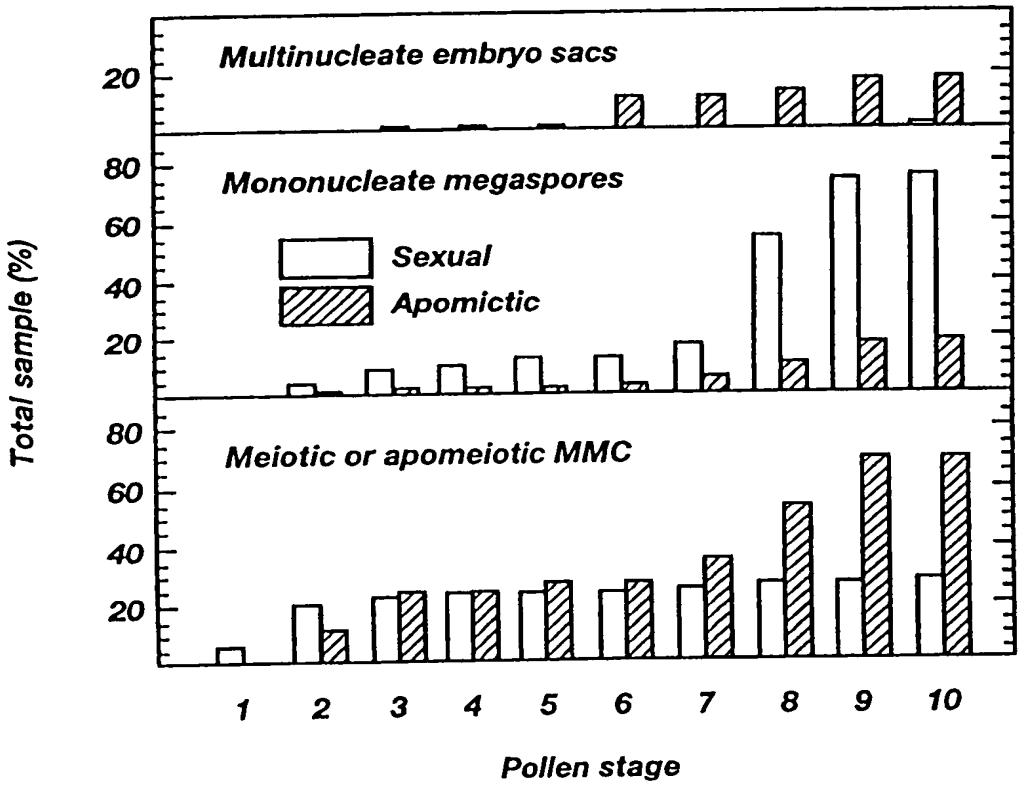

Fig. 4